Effects of potassium rates and types on growth, leaf gas exchange and biochemical changes in rice (Oryza sativa) planted under cyclic water stress

ABSTRACT

Three levels of potassium rates [80 kg K2O haī 1, 120 kg K2O haī 1 and 160 kg K2O haī 1) and two types potassium (KCl and K2SO4) on rice under cyclic water stress 15 days and the absolute control (80 kg K2O haī 1 of KCl fertilizer on rice under control flooded) were exposed to rice to investigate the influence of potassium in minimizing cyclic water stress effects in rice. It was found as fertilization rates increased from 80 > 120 > 160 kg K2O haī 1 the production of proline was increased. The increase in proline production was simultaneously enhanced the production of Catalase and Maliondialdehyde. As the potassium rate increased from 80 > 120 > 160 kg K2O haī 1, the transpiration rate was observed to be increased in both potassium types. The result suggested that high potassium rates would reduce water stress effects by having high transpiration rate. High transpiration rate would increase the nutrient uptake that would repair the damage tissue under water stress thus reduce the oxidative stress of rice under water stress condition. This been showed by high significant positive correlations of transpiration rate with CAT activity (r = 0.871; p Ò0.05), MDA (r = 0.914; p Ò0.05) and Proline (r = 0.842; p Ò0.05). It was found that the increase of K rates by KCl increased NAR higher than the increased K rates in K2SO4. This might be due to higher absorption of K element in rice by KCl compared to K2SO4. The study has showed that application of potassium either KCl or K2SO4 would minimize the effects on rice growth and physiology under cyclic water stress. The current study also suggested that plant tolerate to cyclic water stress by increased the production of proline, MDA and decrease of Catalase activity to protect the plant from damage from water stress.

Keyword: Cyclic water stress; Potassium; Growth and yield; Leaf gas exchange responses; Biochemical changes